

Evaluating the *iCoupler* **ADuM1240ARSZ/ADuM1241ARSZ/ADuM1245ARSZ/ADuM1246ARSZ** with the **EVAL-ADuM1241EBZ** Evaluation System

FEATURES

Access to both data channels
 Multiple connection options
 Support for Tektronix active probes
 Provision for cable terminations
 Support for PCB edge-mounted coaxial connectors
 Easy configuration
 Installed *iCoupler* digital isolator: **ADuM1241** in the 20-lead SSOP package

SUPPORTED *iCoupler* MODELS

ADuM1240ARSZ

ADuM1241ARSZ

ADuM1245ARSZ

ADuM1246ARSZ

GENERAL DESCRIPTION

The **EVAL-ADuM1241EBZ** supports the **ADuM1240ARSZ**, **ADuM1241ARSZ**, **ADuM1245ARSZ**, and **ADuM1246ARSZ**, which are ultralow power, dual-channel *iCoupler*® isolators. The evaluation board provides a JEDEC standard 20-lead SSOP pad layout, support for signal distribution, loopback, and loads referenced to V_{DDX} or GND_X , as well as optimal bypass capacitance. Signal sources can be wired onto the board as well as brought onto the board through edge-mounted SMA connectors (sold separately) or terminal blocks for power connections. The board includes 200 mil header positions for compatibility with Tektronix active probes.

The board follows best printed circuit board (PCB) design practices for 4-layer boards, including a full power and ground plane on each side of the isolation barrier. No other EMI or noise mitigation design features are included on this board. In cases of very high speed operation or when ultralow emissions are required, refer to the [AN-1109](#) application note for additional board layout techniques.

PHOTOGRAPH OF THE EVALUATION BOARD

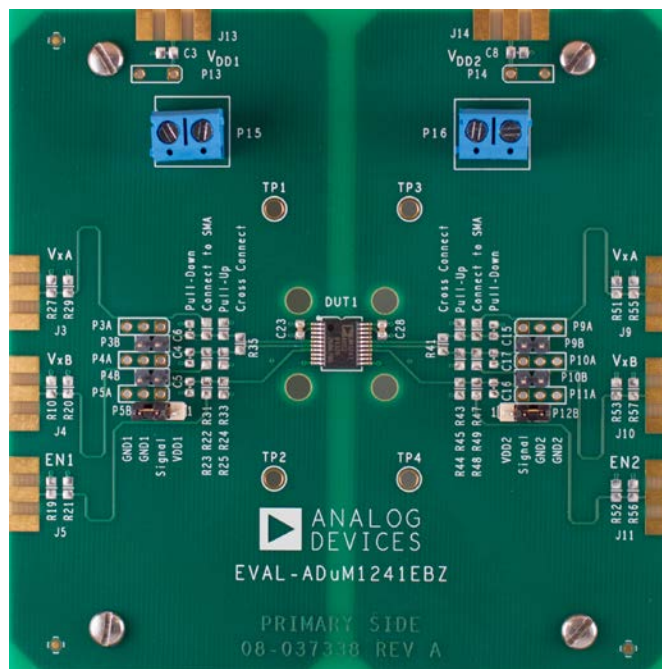


Figure 1. **EVAL-ADuM1241EBZ** Evaluation Board

TABLE OF CONTENTS

Features	1	Connectors	3
Supported iCoupler Models	1	Power Input	3
General Description	1	Data I/O Structures	3
Photograph of the Evaluation Board.....	1	Bypass on the PCB	4
Revision History	2	High Voltage Capability	4
Evaluation Board Circuitry	3	Evaluation Board Schematics and Artwork.....	5
PCB Evaluation Goals.....	3	Bill of Materials.....	7

REVISION HISTORY

3/14—Revision 0: Initial Version

EVALUATION BOARD CIRCUITRY

PCB EVALUATION GOALS

The EVAL-ADuM1241EBZ board is intended to achieve the following goals:

- Evaluate the full range of *iCoupler* data transfer functions
- Power each side of the *iCoupler* isolator independently
- Allow high differential voltage to be applied between the two sides of the *iCoupler* isolator
- Allow connecting easily to power and instrumentation

Although the evaluation board comes with the ADuM1241ARSZ *iCoupler* digital isolator installed, the board is also compatible with the ADuM1240ARSZ, ADuM1245ARSZ, and ADuM1246ARSZ, and the user can substitute any of these components in place of the ADuM1241ARSZ.

CONNECTORS

The PCB provides support for three types of interconnections:

- SMA edge-mounted connectors
- Through-hole signal ground pairs
- Terminal blocks for power connections

With these three options, both temporary and permanent connections to the board can easily be made.

When coaxial connections are desired, SMA connector positions are available for the V_{DD1} and V_{DD2} power supplies, as well as all digital inputs and outputs. These SMA connector positions are left unpopulated so that the user can customize the connectors for a given application. Figure 2 shows examples of installed SMA connectors; these connectors were chosen because they are not only low profile and provide excellent mechanical connections to the PCB but also support 50 Ω coaxial cabling. Because most lab equipment is compatible with BNC connectors, adaptors may be required to use some on-board connectors.

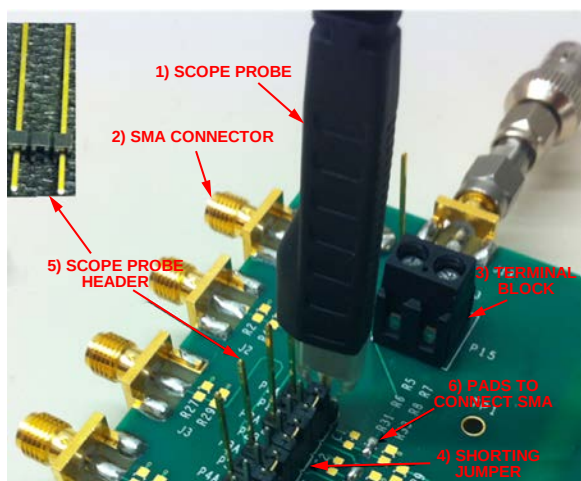


Figure 2. Optional Components

Power can be connected through the P1 and P2 terminal blocks or can be wired directly to the PCB via the P13 and P14 through-hole connectors. Each through-hole pair provides a power ground pair with the power on the Pin 1 hole. The pin spacing of each through-hole connector is 200 mil between centers. This matches the pin spacing required for Tektronix active scope probes. If a scope probe connection is desired, the header shown in Figure 2 can be soldered into the through-hole positions, and the signal pin can be trimmed to match the height requirements of a Tektronix active scope probe.

POWER INPUT

Each side of the ADuM1240ARSZ/ADuM1241ARSZ/ADuM1245ARSZ/ADuM1246ARSZ *iCoupler* isolator requires an off-board power source. Each power source must be independent if common-mode voltages are to be applied across the isolation barrier. Sharing a single supply for both sides of the part across the isolation barrier does not harm the isolator, and it is useful for functional testing of the ADuM1240ARSZ/ADuM1241ARSZ/ADuM1245ARSZ/ADuM1246ARSZ *iCoupler* isolators when common-mode voltages are not present. If common-mode voltages are to be applied across the isolation barrier, independent power supplies must be provided for each side of the isolator.

A ground plane and a power plane are present on Layer 2 and Layer 3 of the PCB on each side of the isolation barrier. Power connects to V_{DD1} for Side 1 and connects to V_{DD2} for Side 2. The A and B power pins on each side cannot be powered separately.

DATA I/O STRUCTURES

Each data channel has a variety of structures to help configure, load, and monitor both the input and output. Figure 3 shows one of the datapaths from an external connection to the DUT pin. Each channel has similar connections.

Starting at the external connection, the signal path is

1. A pad layout for a PCB board edge-mounted SMA connector.
2. Two 0805 pads are provided where 100 Ω resistors to ground can be installed. The combined resistance is 50 Ω to provide a termination for a standard coaxial cable.
3. A standard 0805 pad layout that allows the coaxial and termination structures to be connected to the rest of the signal path.
4. A 0603 pad layout between the signal path and V_{DD1} or V_{DD2} can be used for installing a pull-up resistor.
5. A populated 2-pin header provides a signal ground pair that can be used for clip leads or for shorting a channel to ground temporarily.
6. There are groupings of three open through holes, consisting of a signal and two ground connections. These holes can be used for hardwiring signal wires into the PCB, installing a header to accept a Tektronix active probe, or installing a

2-pin header to allow adjacent channels to temporarily be shorted together.

7. A 0805 pad layout between the signal and ground where a load capacitor or resistor can be installed.
8. Pads to the adjacent channels are provided to allow permanent connection of adjacent channels. Inputs can be fanned out to several channels, or inputs and outputs can be connected together to allow signals to loopback.

Figure 2 shows many of the optional components installed, as well as how jumpers can be used to temporarily connect channels. This figure shows a signal connected to the first channel SMA and then fanned out to the top three channels and monitored by an active scope probe.

BYPASS ON THE PCB

Several positions and structures are provided to allow optimum bypass of the evaluation board. Provision has been made for optional surface-mount bulk capacitors to be installed near the power connectors to compensate for long cables to the

power supply. Parallel bypass capacitors are installed near the [ADuM1241ARSZ](#) and consist of a 0.1 μF capacitor for V_{DD1} on the top side and bottom side and a 0.1 μF capacitor for V_{DD2} on the bottom side of the board. It is best to use the top side bypass positions if possible.

The PCB also implements a distributed capacitive bypass on the PCB. This consists of power and ground planes closely spaced on the inner layers of the PCB. This minimizes noise and the transmission of EMI without using complex design features.

HIGH VOLTAGE CAPABILITY

This PCB is designed in adherence with 2500 V basic insulation practices. High voltage testing beyond 2500 V is not recommended. Appropriate care must be taken when using this evaluation board at high voltages, and the PCB should not be relied on for safety functions because it has not been high potential tested (also known as hipot tested or dielectric withstanding voltage tested) or certified for safety.

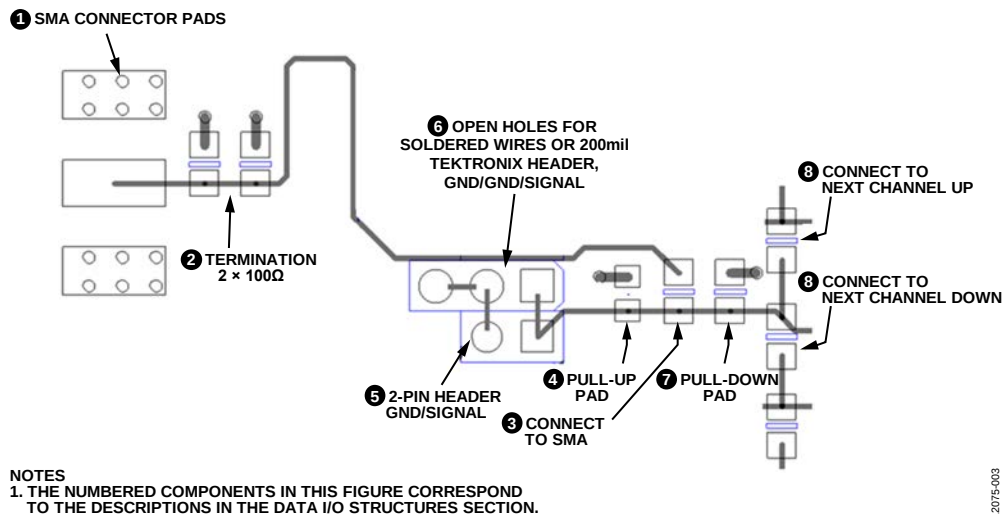


Figure 3. Configuration and Monitoring Structures (Showing a Datapath from an External Connection to the DUT Pin)

12075-003

EVALUATION BOARD SCHEMATICS AND ARTWORK

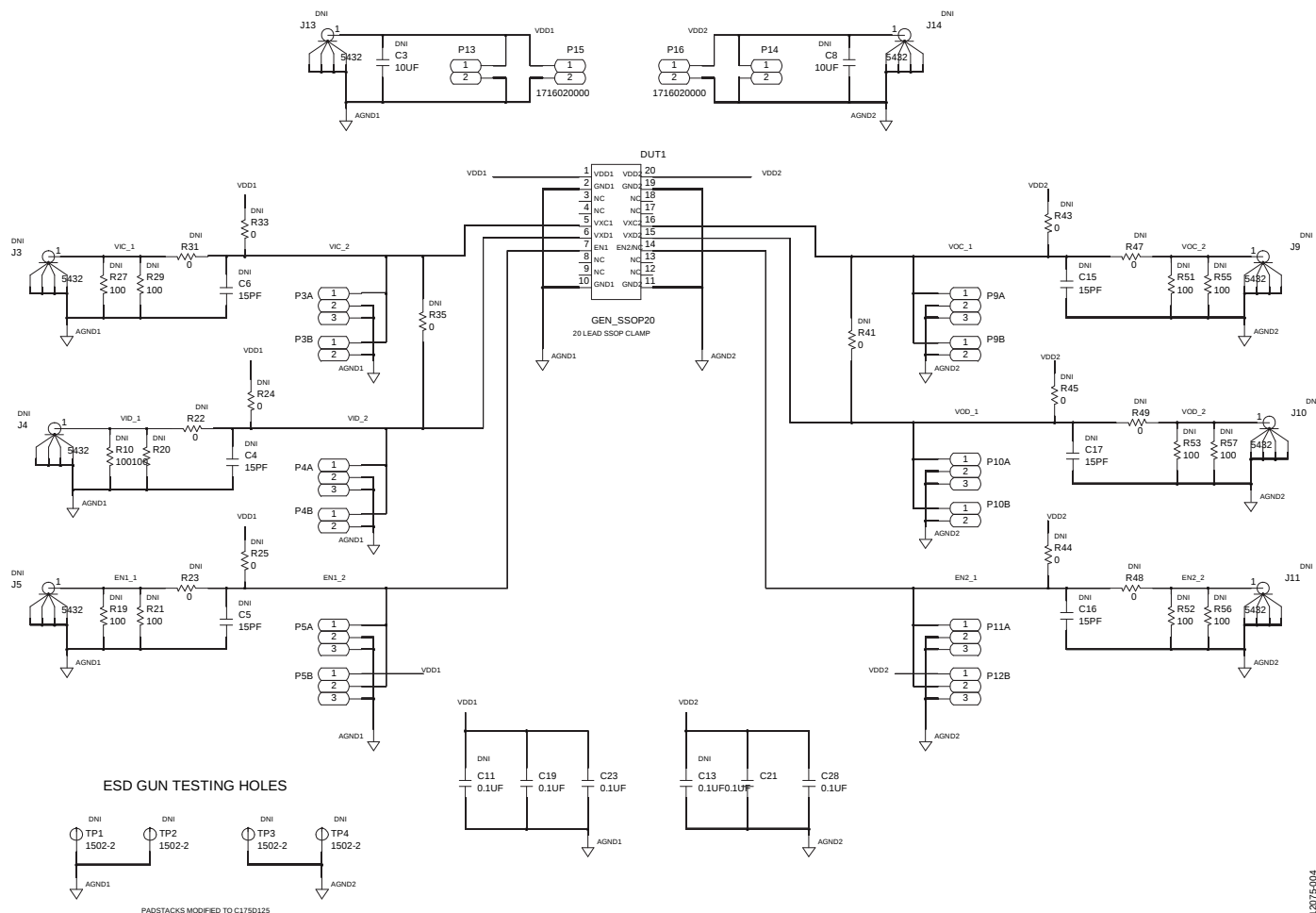
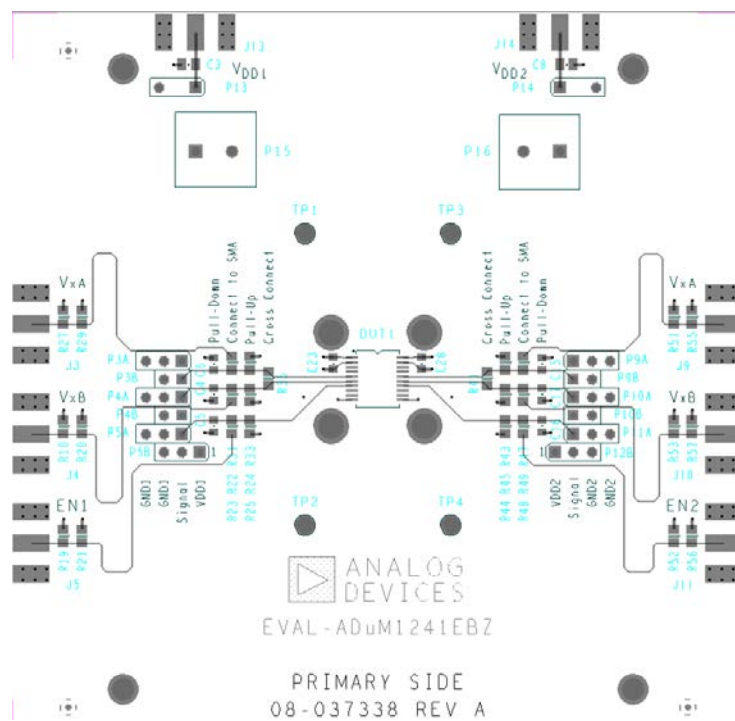


Figure 4. EVAL-ADuM1241EBZ Schematic



BILL OF MATERIALS

Table 1. Bill of Materials

Qty	Reference Designator	Description	Part Number ¹
1	U1	DUT	Analog Devices, Inc., ADuM1241ARSZ
2	C23, C28	0.1 μ F, 16 V, 10%, 0603	AVX 0603YC104KAT2A
2	C3, C8	0805 bypass capacitor position	DNI
17	R19 to R21, R22 to R25, R31, R33, R35, R41, R43 to R45, R47 to R49	0805 pad for optional, application-specific connections	DNI
9	C4 to C6, C11, C13, C15, C17, C19, C21	0603 pad for optional, application-specific connections	DNI
2	P15, P16	Terminal block	On-Shore Technology, Inc., OSTTC022162
6	P3A to P5A, P9A to P11A	2-pin header, 200 mil spacing (not installed)	Samtec MTSW-202-12-G-S-730
2	P5B, P12B	3-pin header 100 mil spacing	FCI, 90726-403HLF
7	P3B to P5B, P9B to P12B	2-pin header 100 mil spacing	Samtec HTSW-102-07-T-S
8	J3 to J5, J9 to J11, J13, J14	SMA edge connector (not installed)	Johnson/Emerson Network Power Connectivity Solutions, Inc., 142-0701-851

¹ DNI = do not install.

NOTES

**ESD Caution**

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. **CONFIDENTIALITY.** This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. **ADDITIONAL RESTRICTIONS.** Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. **TERMINATION.** ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. **LIMITATION OF LIABILITY.** THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NONINFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). **EXPORT.** Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. **GOVERNING LAW.** This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.